Lecture 11

Review for Midterm Exam 1: IR radiative processes

Topics to review:

- **Basic radiometric quantities: intensity and flux. Spectrum of EM radiation.**

Eqs.[2.1]-[2.5]

- **Differential and integral forms of the Beer-Bouguer-Lambert law.**

Differential form: Eqs.[2.6]-[2.7]

Integral form of the extinction law: $I_\lambda = I_0 \exp(-\tau)$

- **Concepts of extinction (scattering + absorption) and emission. Optical depth.**

Eqs.[2.8]-[2.10], [2.12]-[2.13]

- **The differential equation of radiative transfer and its solutions.**

Eqs.[2.14]-[2.16]

- **The differential equation of radiative transfer and its solutions in a plane-parallel atmosphere.**

Eqs.[2.17]-[2.19]

- **Main radiation laws. Concepts of a blackbody, thermodynamical equilibrium, and local thermodynamical equilibrium**.

Planck function, Stefan-Boltzmann law, Wien's displacement law, Kirchhoff's law

Eqs.[3.1]-[3.5]

- **Absorption by atmospheric gases. Concepts of rotational, vibrational and rotational-vibration transitions. Line profiles. Absorption coefficient and transmission function.**

Eqs.[6.6]-[6.7], [7.1]-[7.2]

- **IR absorption spectra of main atmospheric gases (H_2O, CO_2, O_3, CH_4, N_2O, CFCs).**

(Figure 7.1 and Table 7.2)

- **IR radiative transfer in the plane-parallel atmosphere (Lectures 8 and 11)**

Eqs.[8.1], [8.3]-[8.4], [11.2], [11.5]

- **Basics of line-by-line radiative transfer (Lecture 8)**

- **Basics of the K-distribution approximation (Lecture 9)**

- **IR radiative heating/cooling rates**

Eqs.[11.6]-[11.8],

NOTE: Please also review Labs 1-6, homework 1, and problem solving examples.